C-2.5 Compare alpha, beta, and gamma radiation in terms of mass, charge, penetrating power, and the release of these particles from the nucleus.

Revised Taxonomy Level 2.6 <u>Compare</u> conceptual knowledge

This concept was not addressed in physical Science

It is essential for students to

- Understand the type of radiation that may be emitted during nuclear reactions

Type of radiation emitted & symbol	Nature of the radiation	Nuclear Symbol	Penetrating power, and what will block it	Effect of release of particles from the nucleus
α **Alpha**	a helium nucleus of 2 protons and 2 neutrons, mass = 4, charge = +2	$^{4}_{2}He$	Low penetration stopped by a few cm of air or thin sheet of paper	Reduces the atomic mass number by 4 Reduces the atomic number by 2
β **Beta**	high kinetic energy electrons, mass = 1/1850 of alpha, charge = -1	$^{0}_{-1}e$	Moderate penetration, most stopped by a few mm of metals like aluminum	Is the result of neutron decay and will increase the atomic number by 1 but will not change the mass number
γ **Gamma**	very high frequency electromagnetic radiation, mass = 0, charge = 0	$^{0}_{0}\gamma$	Very highly penetrating, most stopped by a thick layer of steel or concrete, but even a few cm of dense lead doesn't stop all of it!	Is electromagnetic radiation released from an excited nucleus. The atomic number and mass number do not change.

Assessment

As stated in the indicator, the major focus of assessment is to <u>compare</u> (detect correspondences) in the most common types of radiation that are released during nuclear reactions. Because the indicator is written as <u>conceptual knowledge,</u> assessments should require that students understand the "interrelationships among the basic elements within a larger structure that enable them to function together." In this case, assessments must show that students understand how the structure of the particle determines its penetrating effect and ionization power.